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function is far less complete, and one form of implement, while perhaps suggested by a special want and having a peculiar fitness for some one function, must perforce do duty in many ways.

SIGNIFICANCE TO THE ARCHÆOLOGIST OF MEDICINE PRACTICES.

In conclusion I wish to record my belief that the practices of the medicine man and the implements of his profession, together with objects connected with superstitious practices generally, are too often lost sight of or ignored by the archæologist in the consideration of the possible uses of relics. When an article of unknown use is brought to light, the first question naturally is, to what practical use can it have been put? and too frequently the inquiry stops here and is limited to the economic side of the question, as though everything made or employed by the savage must have an economic function. Yet a large part of the life of the savage is passed in the observance of superstitious practices. In war or at peace, whether about to start on a hunting trip or to engage in the peaceful pursuits of agriculture, his movements are largely regulated by omens and signs more or less intimately connected with sorcery practices. Such practices, centered, as they are, in the medicine man, who is both priest and conjurer, require abundant paraphernalia suited to their important and mysterious functions. Doubtless much of the paraphernalia is of a perishable nature, and not likely to reach the hands of the archæologist. No one, however, can believe that all the "tools of the craft" are perishable—no one, at least, who has examined the contents of a medicine bag or inspected the accouterments of a medicine man when engaged in his office. Notwithstanding the universal practice of sorcery and the apparent fact that a larger or smaller number of the articles used in its practice must endure and be recovered by the archæologist, it is rarely, indeed, that such observances are appealed to in archæologic treatises to explain the possible use of implements of unknown function.

It is true that, from the very nature of the case, the function of such articles is by no means always indicated by their shape and their peculiarities, perhaps, indeed, is rarely thus disclosed; but by keeping in mind the importance of sorcery practices and the probable occurrence in the form of relics of the articles used in these performances, the archæologist will be less likely to err in his theories of function. Furthermore, it is probable that a careful study from the above point of view of relics now of unknown use will frequently reveal peculiarities sufficient to show their function.

Bulletin 33

SMITHSONIAN INSTITUTION

BUREAU OF ETHNOLOGY, J. W. POWELL, DIRECTOR

THE USE OF GOLD AND OTHER METALS

AMONG THE

ANCIENT INHABITANTS OF CHIRIQUI, ISTHMUS OF DARIEN

BY

WILLIAM H. HOLMES

WASHINGTON

GOVERNMENT PRINTING OFFICE

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CONTENTS.

	Page.
General discussion	5
Use of gold and copper	8
The human figure	14
The bird	17
The puma	18
Grotesque figure	19
The fish	19
The frog	19
The alligator	21
The crayfish (?)	21
Miscellaneous	22
Use of bronze	22
Bells	22
Résumé	25

ILLUSTRATIONS.

		Page.
FIG. 1.	Section of an ordinary grave	7
2.	Human figure, formed of copper-gold alloy	14
3.	Grotesque human figure, in gold, from Bollaert	15
4.	Rudely shaped and finished human figure	15
5.	Grotesque human figure, in nearly pure copper, partially coated with yellow gold	16
6.	Grotesque human figure, in nearly pure gold	16
7.	Rudely executed image of a bird	17
8.	Image of a bird, from Bollaert	18
9.	Puma shaped figure	18
10.	Figure of a puma, in base metal	18
11.	Quadruped with grotesque face, in base metal	19
12.	Figure of a fish, by F. M. Otis	19
13.	Large figure of a frog, in base metal plated with gold	20
14.	Small figure of a frog, in base metal plated with gold	20
15.	Figure of an alligator, by F. M. Otis	21
16.	Animal figure, in base metal plated with gold	21
17.	Bronze bells, plated or washed with gold	22
18.	Bronze bell with human features	23
19.	Triple bell or rattle, found on the Rio Grande	23
20.	Example of ancient Mexican bell	24
21.	Frog modeled in clay and used as a vase ornament	27
22.	Grotesque anthropomorphic figures, used in a stool like object of clay	27

USE OF GOLD AND OTHER METALS IN ANCIENT CHIRIQUI.

By William H. Holmes.

GENERAL DISCUSSION.

Until comparatively recent times the province of Chiriqui has remained almost unknown to the world at large. The Isthmus was traversed a number of times by the conquerors, who published accounts of their discoveries, but it was reserved for the period of railroad and canal explorations to give trustworthy accounts of its character and inhabitants.

The situation of Chiriqui is unique. Forming, politically, a part of South America, it belongs in reality to the North American continent. It occupies a part of the great southern flexure of the Isthmus at a point where the shore lines begin finally to turn toward the north. Costa Rica lies to the west and the province of Veragua bounds it upon the east.

The antiquarian literature of the province is extremely limited, being confined to brief sketches, based for the most part upon the testimony of transient visitors, gold hunters, and Government explorers, who took but little note of the unpretentious relics of past ages. As there are few striking monuments, the attention of archæologists was not called to the primeval history of man in this region, and until recently the Isthmus was supposed to have remained practically unoccupied by that group of cultured nations whose works in Peru and Mexico excite the wonder of the world. But, little by little, it has come out that at some period of the past the province was thickly populated and by races possessed of no mean culture. One of the most important additions to our knowledge of the province and its archæologic treasures is furnished in the manuscript notes of Mr. J. A. McNiel, who made the greater part of the collection now deposited in the National Museum. This explorer has personally supervised the examination of many thousands of graves and has forwarded the bulk of his collections to the United States. His explorations have occupied a number of years, during which time he has undergone much privation and has displayed much enthusiasm in pursuing the rather thorny pathway of scientific research.

At the present time this district is inhabited chiefly by Indians and natives of mixed blood, who carry on grazing and agriculture to a limited extent, but subsist largely upon the natural products of the country. These people are generally thought to have no knowledge or

trustworthy tradition of the ancient inhabitants, and are said to care nothing for the curious cemeteries among which they dwell, excepting as a source of revenue. Mr. A. L. Pinart states, however, that certain tribes on both sides of the continental divide have traditions pointing toward the ancient grave builders as their ancestors.

There is probably no valid reason for assigning the remains of this region to a very high antiquity. The highest stage of culture here may have been either earlier or later than the period of highest civilization in Mexico and South America or contemporaneous with it. As to the affinities of the ancient middle Isthmian tribes with the peoples north and south of them we can learn nothing positive from the evidences of their art. So far as the art of pottery has come within my observation, it appears to indicate a somewhat closer relationship with the ancient Costa Rican peoples than with those of continental South America; yet in their burial customs, and especially in their use of gold, they were like the ancient peoples of Middle and Southern New Grenada.

The ancient cemeteries, or *huacas*, as they are called throughout Spanish America, are scattered over the greater part of the Pacific slope of Chiriqui. It is said by some that they are rarely found in the immediate vicinity of the sea, but they occur elsewhere, in the river valleys, on the hills, the plateaus, the mountains, and in the deepest forests. They are very numerous, but generally of small extent. The largest described is said to cover an area of about twelve acres. They were probably located in the immediate vicinity of villages and towns, traces of which, however, are not described by explorers. There can be no doubt that diligent search will bring to light the sites of dwellings and towns. One of the most circumstantial accounts of these burial places is given by Mr. Merritt, who was also the first to make them known to science.[1] Mr. Merritt was director of a gold mine in Veragua, and in the summer of 1859 spent several weeks in exploring the graves of Chiriqui; he therefore speaks from personal knowledge. In the autumn of 1858 two native farmers of the parish of Bugaba, or Bugava, discovered a golden image that had been exposed by the uprooting of a plant. They proceeded secretly to explore the graves, the existence of which had been known for years. In the following spring their operations became known to the people, and within a month more than a thousand persons were engaged in working these extraordinary gold mines. The fortunate discoverers succeeded in collecting about a hundred and thirty pounds weight of gold figures, most of which were more or less alloyed with copper. It is estimated that fifty thousand dollars worth in all were collected from this cemetery, which embraced an area of twelve acres.

Although there are rarely surface indications to mark the position of the graves, long experience has rendered it comparatively easy to discover them. The grave hunter carries a light iron rod, which he runs

[1] J. King Merritt, in a paper read before the American Ethnological Society, 1860.

into the ground, and thus, if any hard substance is present, discovers the existence of a burial. It is mentioned by one or two writers that the graves are in many cases marked by stones, either loose or set in the ground in rectangular and circular arrangements. The graves do not often seem to have had a uniform position in relation to one another or to the points of the compass. In some cases they are clustered about a central tomb, and then assume a somewhat radiate arrangement; again, according to Mr. McNiel, they were placed end to end, occupying long trenches. He describes the pits as being oval and quadrangular and as having a depth ranging from a few feet to eighteen feet.

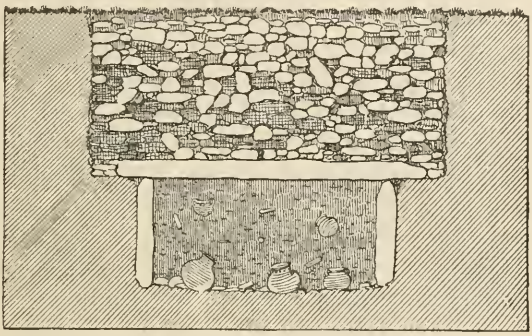

FIG. 1. Section of an ordinary grave, showing the surface pack of river stones and the positions of the slabs and objects of art.

The paving or pack consists of earth and water-worn stones; the latter are pitched in without order and form but a small percentage of the filling. He has never seen such stones used for facing up the walls of the pit or in the construction of pillars. The flat stones which cover the cyst are often ten or fifteen feet below the surface, and are in some cases very heavy, weighing three hundred pounds or more. A single stone is in some cases large enough to cover the entire space, but more frequently two or more flat stones are laid side by side across the cavity. These are supported by river stones a foot or more in length, set around the margin of the cyst. He is of the opinion that both slabs and bowlders were in many cases carried long distances. None of the pits examined were of the extraordinary forms described in detail by A. de Zeltner and others. The implements, pieces of pottery, and ornaments were probably buried with the dead, pretty much as are similar objects in all parts of America. The almost total disappearance of the human remains makes a determination of exact relative disposition impossible. The universal testimony however, is that all were not placed with the body, but that some were added as the graves were filled, being placed in crevices of the walls or pillars or thrown in upon the accumulating earth or pebbles of the surface pavement.

The relics obtained from the tombs are confined almost exclusively to the three least perishable materials: stone, clay, and metal. The

collections show a great preponderance of objects of clay, of which the National Museum now owns about four thousand pieces. Objects of stone are plentiful, comprising perhaps a tenth of the whole number of relics. Objects of metal are comparatively rare; they are described in detail in the following pages.

USE OF GOLD AND COPPER.

The Chiriquians, like many of their neighbors in the tropical portions of the American continent, were skilled in the working of metals. Gold, silver, copper, and tin — the latter in alloys with copper forming bronze — are found in the graves. Gold is the most important and is associated with all the others in alloys or as a surface coating. The inhabitants of the Isthmus at the time of the discovery were rich in objects, chiefly ornaments, of this metal, and expeditions sent out under Balboa, Pizarro, and others plundered the natives without mercy. When the Indian village of Darien was captured by Balboa (1510) he obtained "plates of gold, such as they hang on their breasts and other parts, and other things, all of them amounting to ten thousand pesos of fine gold."[1] From an expedition to Nicaragua, the same adventurers brought back to Panama the value of "112,524 pieces of eight in low gold and 145 in pearls."[2] Early Spanish-American history abounds in stories of this class. Among others we read that Columbus found the natives along the Atlantic coast of Chiriqui and Veragua so rich in objects of gold that he named the district *Castillo del Oro.* It is said that the illusory stories of an *El Dorado* somewhere within the continent of South America arose from the lavish use of gold ornaments by the natives whom the Spaniards encountered, and Costa Rica gets its name from the same circumstance. It is also recorded that the natives of various parts of Central and South America, at the date of the conquest, were in the habit of opening ancient graves for the purpose of securing mortuary trinkets. The whites have followed their example with the greatest eagerness. As far back as 1642 the Spaniards passed a law claiming all the gold found in the burial places of Spanish America,[3] the whole matter being treated merely as a means of revenue.

The objects of gold for which the tombs of Chiriqui are justly famous are generally believed to have been simple personal ornaments, the jewelry of the primeval inhabitants, although it is highly probable that many of the figures had, at least as originally employed, an emblematic meaning. They were, doubtless, at all times regarded as possessed of potent charms, and thus capable of protecting and forwarding the interests of the owners. They have been found in great numbers within the last twenty-five years, but for the most part, even at this late date, have been es-

[1] Herrera, Hist. America, Vol. VI, p. 369.

[2] Herrera, Hist. America, Vol. III, p. 287.

[3] Mr. Hawes's letter answering questions about Chiriqui, read by Mr. Davis before the Am. Eth. Soc., April 17, 1860.

teemed for their money value only. Very many specimens found their way to this country, where they were either sold for curiosities, or, after long waiting for a purchaser, even in the very shadow of our museums, were consigned to the furnace. Many stories bearing upon this point have been told me. A Washington jeweler is represented as having exhibited (about the year 1860) in his window on Pennsylvania avenue a remarkable series of these trinkets, most of which were afterwards sent to New York to be melted. About the same period a gentleman on entering a shop in San Francisco was accosted by a stranger who had his pockets well filled with these curious relics and wished to dispose of them for cash. A number of my acquaintances have neat but grotesque examples of these little images of gold attached to their watch guards, thus approving the tastes of our prehistoric countrymen and at the same time demonstrating the identity of ideas of personal embellishment in all times and with all peoples.

The ornaments are found only in a small percentage of the graves, those probably of persons sufficiently opulent to possess them in life; the great majority of graves contain none whatever. They are often found at the bottom of the pits, and probably in nearly the position occupied by them while still attached to the persons of the dead. It is said that occasionally they are found in the niches at the sides of the graves, as if placed during the filling of the pit.

Strangely enough, the gold is very generally alloyed with copper, the composite metal ranging from pure gold to pure copper. A small percentage of silver is also present in some of the specimens examined, but this is probably a natural alloy. In a few cases very simple figures appear to have been shaped from nuggets or masses of the native metals; this, however, is not susceptible of proof. The work is very skillfully done, so that we find it difficult to ascertain the precise methods of manipulation. The general effect in the more pretentious pieces resembles that of our filigree work, in which the parts are produced by hammering and united by soldering; yet there are many evidences of casting, and these must be considered with care. As a rule simple figures and some portions of composite figures present very decided indications of having been cast in molds; yet no traces of these molds have come to light and there are none of those characteristic markings which result from the use of composite or "piece" molds. Wire was extensively used in the formation of details of anatomy and embellishment, and its presence does not at first seem compatible with ordinary castings. This wire, or pseudo-wire it may be, is generally about one-twenty-fifth of an inch in diameter.

The manner in which the numerous parts or sections of complex figures are joined together is both interesting and perplexing. Evidences of the use of solder have been looked for in vain, and if such a medium was ever used it was identical in kind with the body of the object or so small in quantity as to escape detection. At the junction of the parts

there are often decided indications of hammering, or at least of the strong pressure of an implement; but in pursuing the matter further we find a singular perfection in the joining, which amounts to a coalescence of the metals of the two parts concerned. There is no weakness or tendency to part along the contact surfaces, neither is there anything like the parting of parallel wires in coils or where a series of wires is joined side by side and carried through various convolutions. In a number of cases I made sections of coils and parts composed of a number of wires, in the hope of discovering evidences of the individuality of the strands, but the metal in the section is always homogeneous, breaking with a rough granular fracture and not more readily along apparent lines of junction than across them; and further, in studying in detail the surface of parts unpolished or protected from wear by handling, we find everywhere the granular and pitted unevenness characteristic of cast surfaces. This is true of the wire forms as well as of the massive parts, and in addition to this, such defects occur in the wires as would hardly be possible if they were of wrought gold.

All points considered, I am inclined to believe that the objects were cast, and cast in their entirety. It is plain, however, that the original model was made up of separately constructed parts of wire or wire like strands and of eccentric and often rather massive parts, and that all were set together by the assistance of pressure, the indications being that the material used was sufficiently plastic to be worked after the manner of clay, dough, or wax. In one case, for example, the body of a serpent, consisting of two wires neatly twisted together, is held in the hand of a grotesque figure. The hand consists of four fingers made by doubling together two short pieces of wire. The coil has been laid across the hand and pressed down into it until half buried, and the ends of the fingers are drawn up around it without any indication of hammer strokes. Indeed, the effect is just such as would have been produced if the artist had worked in wax. Again, in the modeling of the eyes we have a good illustration. The eye is a minute ball cleft across the entire diameter by a sharp implement, thus giving the effect of the parted lids. Now, if the material had been gold or copper, as in the specimens, the ball would have been separated into two parts or hemispheres, which would not exhibit any great distortion, but as we see them here the parts are flattened and much drawn out by the pressure of the cutting edge, just as if the material had been decidedly plastic.

It seems to me that the processes of manufacture must have been analogous to those employed by the more primitive metal workers of our own day. In Oriental countries delicate objects of bronze and other metals are made as follows: A model is constructed in some such material as wax or resin, and over it are placed coatings of clay or other substance capable of standing great heat. These coatings, when sufficiently thickened and properly dried, form the mold from which the original model is extracted by means of heat. The fused metal is

afterwards poured in. As a matter of course, both the mold and the model are destroyed in each case, and exact duplications are not to be expected. Mr. George F. Kunz, of New York, with whom I have discussed this matter, states that he has seen live objects, such as insects, used as models in this way. Being coated with washes of clay or like substance until well protected and then heavily covered, they were placed in the furnace. The animal matter was thus reduced to ashes and extracted through small openings made for the purpose. As bearing upon this subject it should be mentioned that occasionally small figures in a fine reddish resin are obtained from the graves of Chiriqui. They are identical in style of modeling with the objects of gold and copper obtained from the same source.

In discussing possible processes, Mr. William Hallock, of the division of chemistry and physics of the United States Geological Survey, suggested that, if the various sections of a metal ornament were imbedded in the surface of a mass of fire clay in their proper relations and contacts, they could then be completely inclosed in the mass, and subjected to heat until the metal melted and ran together; after cooling, the complete figure could be removed by breaking up the clay matrix. I imagine that in such work much difficulty would be experienced in securing proper contact and adjustment of parts of complex figures. It will likewise be observed that evidences of plasticity in the modeling material would not exist. I must not pass a suggestion of Nadaillac[1] which offers a possible solution of the problem of manipulation. Referring to a statement of the early Spanish explorers that smelting was unknown to the inhabitants of Peru, he states that it would be possible for a people in a low state of culture to discover that an amalgam of gold with mercury is quite plastic, and that after a figure is modeled in this composite metal the mercury may be dissipated by heat, leaving the form in gold, which then needs only to be polished. There is, however, no evidence whatever that these people had any knowledge of mercury.

There is no indication of carving or engraving in the Chiriquian work. In finishing, some of the extremities seem to have been shaped by hammering. This is a mere flattening out of the feet or parts of the accessories, which required no particular skill and could have been accomplished with comparatively rude stone hammers. It is a remarkable fact that many, if not most, of the objects appear to be either plated or washed with pure gold, the body or foundation being of base gold or of nearly pure copper. This fact, coupled with that of the association of objects of bronze with the relics, leads us to inquire carefully into the possibilities of European influence or agency. I observe that recent writers do not seem to have questioned the genuineness of the objects described by them but that at the same time no mention is made of the plating or washing. This latter circumstance leads to the infer-

[1] Nadaillac, Prehistoric America, p. 450.

ence that pieces now in my possession exhibiting this phenomenon may have been tampered with by the whites. In this connection attention should be called to the fact that history is not silent on the matter of plating. The Indians of New Grenada are not only said to have been marvelously skillful in the manipulation of metals, but, according to Bollaert, Acosta declares that these peoples had much *gilt* copper, "and the copper was gilt by the use of the juice of a plant rubbed over it, then put into the fire, when it took the gold color."[1] Just what this means we cannot readily determine, but we safely conclude that, whatever the process hinted at in these words, a thin surface deposit of pure gold, or the close semblance of it, was actually obtained. It is not impossible that an acid may have been applied which tended to destroy the copper of the alloy, leaving a deposit of gold upon the surface, which could afterwards be burnished down.

It has been suggested to me that possibly the film of gold may in cases be the result of simple decay on the part of the copper of the alloy, the gold remaining as a shell upon the surface of the still undecayed portion of the composite metal; but the surface in such a case would not be burnished, whereas the show surfaces of the specimens recovered are in all cases neatly polished.

If we should conclude that the ancient Americans were probably able to secure in some such manner a thin film of gold it still remains to inquire whether there may not have been some purely mechanical means of plating. In some of the Chiriquian specimens a foundation of very base metal appears to have been plated with heavy sheet gold, which as the copper decays comes off in flakes. Occasional pieces have a blistered look as a consequence. Were these people able with their rude appliances to beat gold out into very thin leaves, and had they discovered processes by which these could be applied to the surface of objects of metal?

The flakes in some cases indicate a very great degree of thinness. Specimens of sheet-gold ornaments found in the tombs are thicker, but are sufficiently thin to indicate, if actually made by these people, that almost any degree of thinness could be attained. It would probably not be difficult to apply thin sheet gold to the comparatively smooth surfaces of these ornaments and to fix it by burnishing.

Mr. Kunz suggests still another mention by means of which plating could have been accomplished. If a figure in wax were coated with sheet gold and then incased in a clay matrix, the wax could be melted out, leaving the shell of gold within; the cavity could then be filled with alloy, the clay could be removed, and the gold, which would adhere to the metal, could then be properly burnished down.

It will be seen from this hasty review that, although we may conclude that casting and plating were certainly practiced by these peoples, we must remain in ignorance of the precise methods employed.

[1] Bollaert, Ethnological and other Researches in New Granada, &c.

Referring to the question of the authenticity of the specimens themselves, I may note that observations bearing upon the actual discovery of particular specimens in the tombs are unfortunately lacking. Mr. McNiel acknowledges that with all his experience in the work of excavation no single piece has been taken from the ground with his own hands, and he cannot say that he ever witnessed the exhumation by others, although he has been present when they were brought up from the pits. Generally the workmen secrete them and afterwards offer them for sale. He has, however, no shadow of a doubt that all the pieces procured by him came from the graves as reported by his collectors.

The question of the authenticity of the gilding will not be satisfactorily or finally settled until some responsible collector shall have taken the gilded objects, and with his own hands, from their undisturbed places in the tombs.

There are many proofs, however, of the authenticity of the objects themselves. It is asserted by a number of early writers that the American natives were, on the arrival of the Spaniards, highly accomplished in metallurgy; that they worked with blow-pipes and cast in molds; that the objects produced exhibited a high order of skill; and that the native talent was directed with unusual force and uniformity toward the imitation of life forms. It is said that the conquerors were "struck with wonder" at their skill in this last respect. And a strong argument in favor of the genuineness of these objects is found in the fact that it is not at all probable that rich alloys of gold would have been used by Europeans for the base or foundation when copper or bronze, or even lead, would have served as well. We also observe that there is absolutely no trace of peculiarly European material or methods of manipulation, a fact hardly possible if the extensive reproductions were made by the whites. Neither are there traces of European ideas embodied in the shape and in the decoration of the objects, a condition that argues strongly in favor of native origin. An equally convincing argument is found in the fact that all the alloys subject to corrosion exhibit marked evidences of decay, as if for a long period subject to the destructive agents of the soil. In many cases the copper-alloy base crumbles into black powder, leaving only the flakes of the plating. Lastly and most important, the strange creatures represented are in many cases identical with those embodied in clay and in stone, and for these latter works no one will for a moment claim a foreign derivation. At the end of this paper I present two cuts of objects modeled in clay, intended to illustrate this point.

Considering all these arguments, I arrive at the conclusion that the ornaments are, in the main, genuine antiquities, and that, if any fraud at all has been practiced, it is to be laid at the door of modern goldsmiths and speculators, who, according to Mr. McNiel, are known in a few cases to have "doctored" alloyed objects with washes of gold, with the view of selling them as pure gold.

I present the following specimens with a reasonable degree of confidence that all, or nearly all, are purely American products, and I sincerely hope that at no distant day competent archæologists may have the opportunity of making personal observations of similar relics in place.

The objects consist to a great extent of representations of life forms, in many cases more fanciful than real and often extremely grotesque.

They include the human figure and a great variety of birds and beasts indigenous to the country, in styles resembling work of the same region in clay and stone. My illustrations show the actual size of the objects.

The human figure.—Statuettes of men and women and of a variety of anthropomorphic figures of all degrees of elaboration abound. Fig. 2

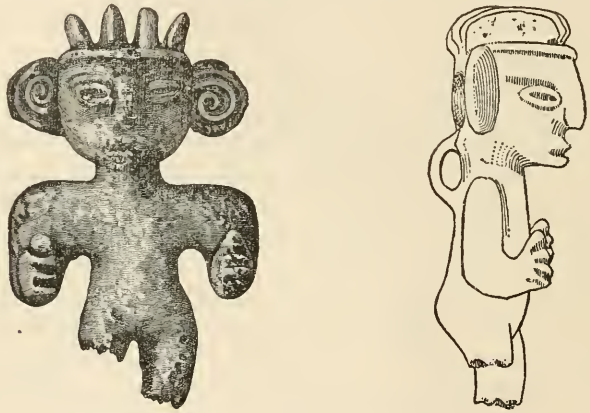

FIG. 2. Human figure, formed of copper-gold alloy.

illustrates a plain, rude specimen belonging to the collection of J. B. Stearns. It was obtained by Mr. McNiel from near the south base of Mount Chiriqui. The body is solid and the surface is rough and pitted, as if from decay. In many respects it resembles the stone sculptures of the Isthmus. The metal is nearly pure copper. A piece exhibiting more elaborate workmanship, and published by Bollaert,[1] is shown in Fig. 3. Another remarkable specimen is illustrated by De Zeltner, but the photograph published with his brochure is too indistinct to permit of satisfactory reproduction. He describes it in the following language: "The most curious piece in my collection is a gold figure of a man, 7 centimeters in height. The head is ornamented with a diadem terminated on each side with the head of a frog. The body is nude, except a girdle, also in the form of a plait supporting a flat piece intended to cover the privates, and two round ornaments on each side. The arms are extended from the body; the well drawn hands hold, one of them, a short, round club, the other a musical instrument, of which one end is in the mouth and the other forms an enlargement like that of a flute, made of human bone. It is not probable that this is a pipe. Both

[1] Bollaert's Antiquarian Researches in New Granada, plate opp. p. 31.

thighs have an enlargement and the toes are not marked in this little figurine."[1]

FIG. 3. Grotesque human figure in gold, from Bollaert.

In Fig. 4 we have a rather rudely made and finished piece collected by Mr. McNiel and now owned by Mr. Stearns. It exhibits features

FIG. 4. Rudely shaped and finished human figure.

corresponding to a number of those referred to by De Zeltner. The foundation is quite thin and is of a base metal coated with pure gold.

[1] A. De Zeltner: Note sur les sépultures indiennes du département de Chiriqui.

I present two additional examples of the human figure from the collection of Mr. Stearns. One of them, Fig. 5, is an interesting little statuette in dark copper that still retains traces of the former gilding of yellow gold. The crown is flat and is surrounded by a fillet of twisted wire. The face is grotesque, the nose being bulbous, the mouth large, and the lips protruding. The hands are represented as grasping cords of wire which connect the waist with the crown of the figure and seem to be intended for the bodies of serpents, the heads of which project from the sides of the head dress. Similar serpents project from the ankles. The feet are flattened out as if intended to be set in a crevice.

FIG. 5. Grotesque human figure, in nearly pure copper, partially coated with yellow gold.

The extremities—excepting the feet—the costume, and the ornaments are all formed of wire. The various parts of the figure have been modeled separately and set together whilst the material was in a plastic or semi-plastic condition. This is clearly indicated by the sinking of one part into another at the points of contact.

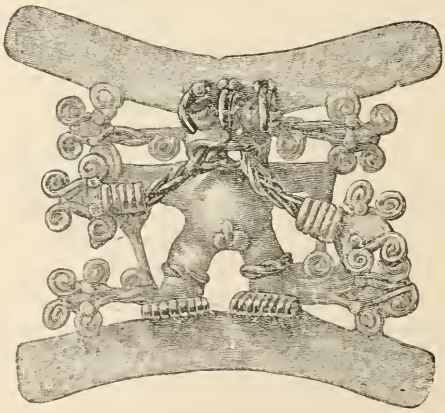

FIG. 6. Grotesque human figure, in nearly pure gold.

An excellent example of the more elaborate figures is shown in Fig. 6. It is of reddish gold, slightly alloyed, no doubt with copper, and

has in finishing received a very thin wash or plating of yellow gold, which is worn off in exposed parts. The central feature of the rather complicated structure is a grotesque human figure, much like the preceding, and having counterparts in both clay and stone. The figure is backed up and strengthened by two curved and flattened bars of gold, one above and the other below, as seen in the cut. The figure is decked with and almost hidden by a profusion of curious details, executed for the most part in wire, and representing serpents and birds. Three vulture like heads project from the crown and overhang the face. Two serpents, the bodies of which are formed of plaited wire, issue from the mouth of the figure and are held about the neck by the hands. The heads of the serpents are formed of wire folded in triangular form, and are supplied with two double coils of wire at the sides, as if for ears, and with two little balls of gold for eyes. Similar heads project from the sides of the head and from the feet of the image.

The peculiarities of construction are seen to good advantage in this specimen. The figure is made up of a great number of separate pieces, united apparently by pressure or by hammering while the material was somewhat plastic. Upwards of eighty pieces can be counted. The larger pieces, forming the body and limbs, are hollow or concave behind. Nearly all the subordinate parts are constructed of wire.

The bird.—Images of birds are quite numerous and vary greatly in size and elaboration. They are usually represented with expanded wings and tails, the under side of the body being finished for show. The back is left concave and rough, as when cast, and is supplied with a ring, for suspension or attachment, as seen in the profile view, Fig. 7. The

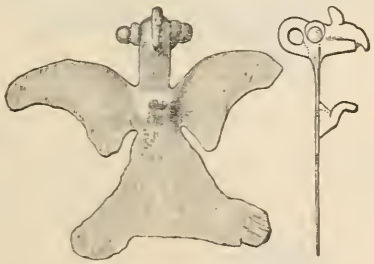

Fig. 7. Rudely executed image of a bird.

owl, the eagle, the parrot, and various other birds are recognized, although determinations of varieties are not possible, as in many cases the forms are rude or greatly obscured by extraneous details. The example shown in Fig. 7 is of the simplest type and the rudest workmanship, and is apparently intended for some rapacious species, possibly a vulture. The body, wings, and tail are hammered quite thin and are left frayed and uneven on the edges. The material appears to be nearly pure copper, plated with yellow gold. Specimens of this class are very numerous. One, presented in a publication of the Society of Northern

Antiquaries, and now in the museum at Copenhagen, is thought to be intended for a fish hawk, as it carries a fish in its mouth. De Zeltner mentions a statuette in gold of a paroquet, whose head is ornamented with two winged tufts. Such a specimen may be seen in the collection of Mr. Stearns.

Fig. 8 is reproduced from Bollaert and represents a very elaborately worked parrot.

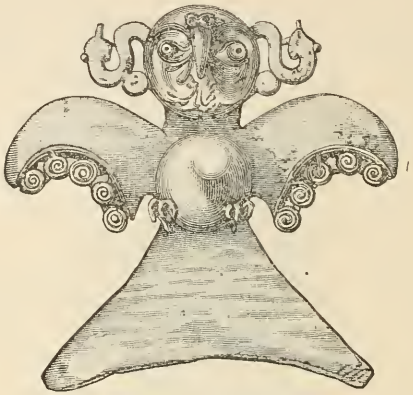

Fig. 8. Image of a bird, from Bollaert.

The puma.— Representations of quadrupeds are quite common ; a good example, copied from Bollaert, is given in Fig. 9. The animal intended

Fig. 9 Puma shaped figure.

is apparently a puma, a favorite subject with Chiriquian workers in clay and stone as well as in gold. The body is hollow and open beneath

Fig. 10. Figure of a puma in base metal.

and the fore feet are finished with loops for suspension. A similar piece with head thrown back over the body is shown in Fig. 10. The metal in this case appears to be nearly pure copper.

Grotesque figure.—Another piece collected by Mr. McNiel is outlined in Fig. 11. The metal is quite base and the surface has been coated

FIG. 11. Quadruped with grotesque face, in base metal.

with gold, which is now nearly all rubbed off. The shape is that of a quadruped. The head is completely reversed, and the face has a rather grotesque, not to say satanic, expression. The details are not unlike those of other examples previously given.

The fish.—The fish was a favorite subject with the ancient nations of South America, and is modeled in clay, woven into fabrics, and worked in metals with remarkable freedom. It was in great favor in Chiriqui and must have been of importance in the mythology of the country. It occurs most frequently in pottery, where it is executed in color and

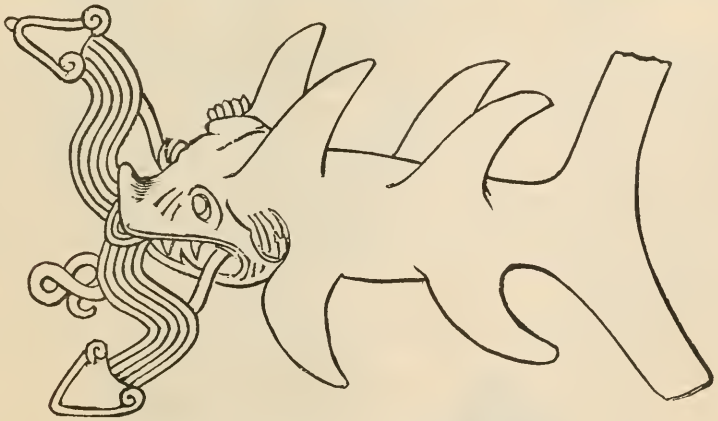

FIG. 12. Figure of a fish, published by F. M. Otis, in Harper's Weekly.

modeled in the round. The very grotesque specimen in gold shown in Fig. 12 is copied from Harper's Weekly of August 6, 1859, where it forms one of a number of illustrations of these curious ornaments. The paper is by Dr. F. M. Otis, who had just returned from Panama.

The frog.—The frog appears in the plastic art of Chiriqui more frequently perhaps than any other reptile. Its form is reproduced with

much spirit and in greatly varying sizes, degree of elaboration, and style of presentation. It is probable that a number of species are represented. In Fig. 13 we have a large, rather plain specimen, now in the National

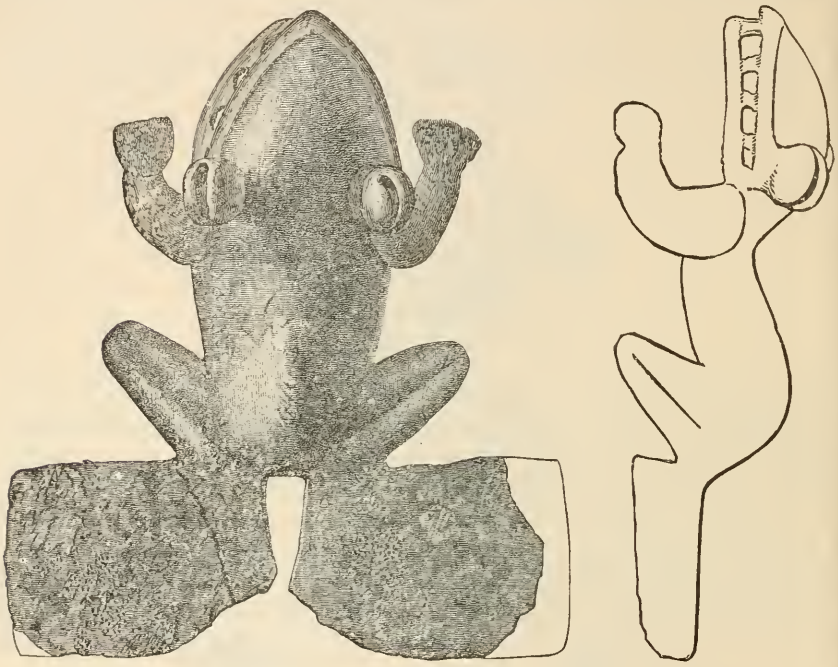

FIG 13. Large figure of a frog, in base metal plated with gold.

Museum. The body and limbs are concave beneath, the metal being about one-sixteenth of an inch thick. The teeth are suggested by a number of perforations encircling the jaws and the eyes are minute hawk bells containing pellets of metal. The legs are placed in characteristic positions, and the hind feet are broad plates without indications of toes, a characteristic of these golden frogs. The framework or foundation is of copper, apparently nearly pure, and the surface is plated with thin sheet-gold, which tends to flake off as the copper foundation corrodes.

The minute delicately finished example given in Fig. 14 contrasts

FIG. 14. Small figure of a frog, in base metal plated with gold.

strongly with the preceding. It is also of base metal plated with pure gold, and belongs to the collection of Mr. Stearns.

The alligator.—The alligator, which appears so frequently in the pottery of Chiriqui, is only occasionally found in gold. A graphic specimen illustrated in Harper's Weekly of August 6, 1859, is given in Fig. 15. A similar piece formed of base metal is in the collection of Mr. Stearns.

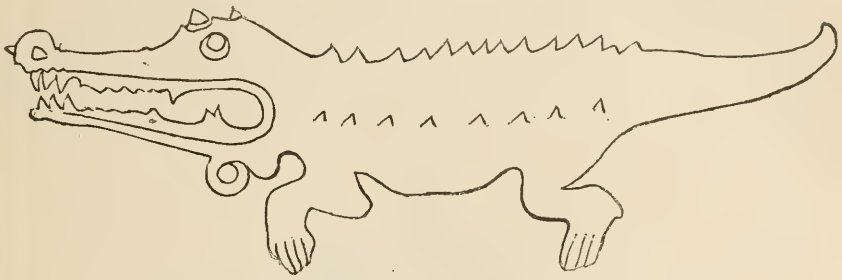

FIG. 15. Figure of an alligator, published by F. M. Otis, in Harper's Weekly.

The crayfish (?).—In Fig. 16 we have a fine specimen intended apparently to represent a crayfish or some similar crustacean form. The head is supplied with complicated yet graceful antennæ-like appendages, made of wire, neatly coiled and welded together by pressure or hammering. The eyes are globular and are encircled by the ends of a

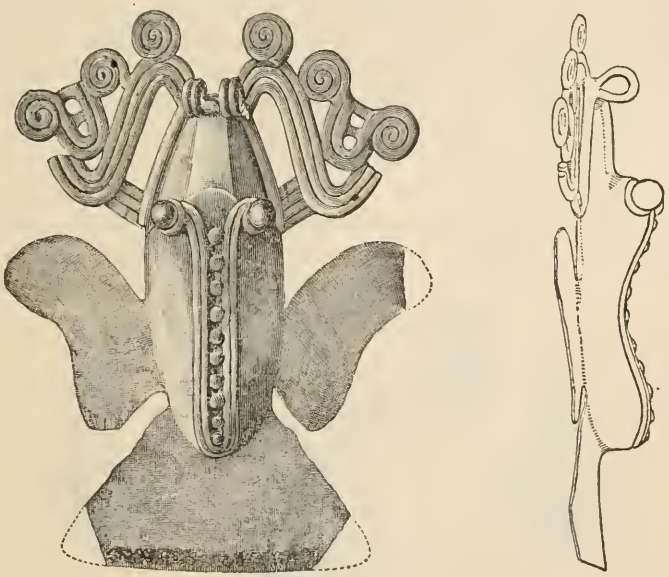

FIG. 16. Animal figure, in base metal plated with gold.

double loop of wire which extends along the back and incloses a line of minute balls or nodes. The peculiar wings and tail will be best understood by referring to the illustration. The foundation metal is much corroded, being dark and rotten, and the plating of reddish gold seems to have been coated with a thin film of yellow gold. The profile

view gives a good idea of the thickness of the metal and of the relief of the parts. Two rings or loops of doubled wire are attached to the extreme end of the nose and a heavy ring for suspending is fixed to the under side of the head.

Miscellaneous.—Gold, pure and in the usual alloys, was also used in the manufacture of other articles, such as bells, beads, disks, balls, rings, whistles, thimble shaped objects, and amulets of varied shapes. Bells are more generally made of bronze, because, perhaps, of its greater degree of resonance. Thin plates, or rather circular sheets, of gold leaf are numerous. One mentioned by Bollaert was 7¼ inches in diameter. They are plain or crimped about the margins, indented in various ways, and sometimes perforated, apparently for suspension or attachment. Merritt mentions examples having holes which showed evidences of wear upon one side only, indicating attachment in a fixed position to some object or to some part of the costume. But one example is at hand, a thin sheet, 3 inches in diameter, and crimped or indented neatly about the margin. Its thickness is about that of ordinary tinfoil.

USE OF BRONZE.

Bells.—Bells were in pretty general use by the more cultured American races previous to the conquest. The form best known is the hawk bell, or common sleigh bell of the North. The globular body is suspended by a loop at the top and is slit on the under side, so that the tinkling of the small free pellets of metal may be audible. Such bells are found in considerable numbers in the graves of Chiriqui, although I have no positive assurance that any of the examples in my possession were actually taken from graves which contained typical Chiriquian relics of other classes. The specimens now in the National Museum, Fig. 17, are in most cases, if not in all, of bronze, as demonstrated by

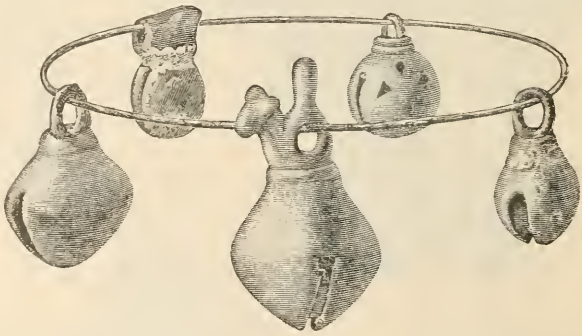

FIG. 17. Bronze bells, plated or washed with gold.

Mr. R. B. Riggs, of the chemical laboratory of the United States Geological Survey. All have been cast in molds. In most cases there are traces of a plating of gold. The largest is 1¼ inches in height and three-fourths of an inch in diameter. It is surmounted by the rude figure

of an animal, through or beneath the body of which is an opening for the attachment of a cord. Others have simple loops at the top. A number of examples are illustrated in Fig. 17. The additional piece given in Fig. 18 is unique in conception. It represents a human head which takes an inverted position when the bell is suspended. The lower part of the bell forms a conical crown to the head and the ring of suspension is attached to the chin. Double coils of wire take the place of the ears, and the other features are formed by setting on bits of the material used in modeling. This specimen belongs to the collec-

FIG. 18. Bronze bell with human features.

tion of Mr. Stearns. Many examples of more elaborate workmanship have been recovered from the tombs and are now to be found in the collections of America and Europe.

A specimen found many years ago on the Rio Grande, near Panama, and figured in Harper's Weekly, was of gold and showed specific varia-

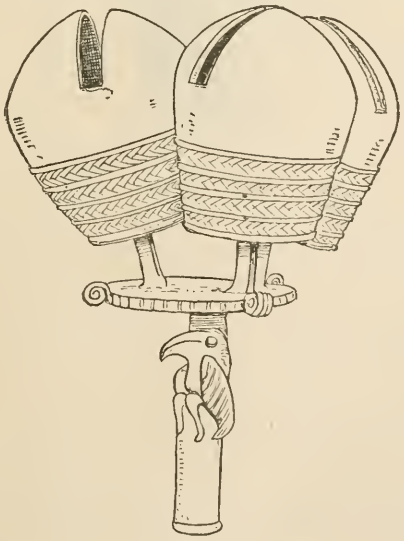

FIG. 19. Triple bell or rattle, found on the Rio Grande.

tions from the Chiriquian pieces. It will be seen by reference to the outline given in Fig. 19 that three very neatly shaped and gracefully

ornamented bells are mounted upon a circular plate, to which a short handle is attached. It was evidently not intended for suspension, but rather to be held in the hand as a rattle.

A question as to the authenticity of these bells as aboriginal works very naturally arises, and it may be difficult to show to the satisfaction of the skeptical mind that any particular specimen is not of European origin or inspiration. At the same time we are not without strong proofs that such bells were in use by the Americans before the advent of the whites. Historical accounts are not wanting, but I shall only stop to point out some of the internal evidences of the native art. The strongest argument is to be found in the presence of analogous features in other branches of the art and in other arts. The eyes of the golden figures of reptiles are in many cases minute hawk bells, and in works of clay, the purely aboriginal character of which has not been called in question, similar features are discovered. The American origin of the bell is not, therefore, to be questioned. The form originated, no

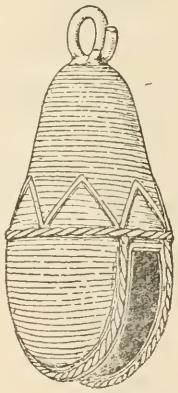

FIG. 20. Example of ancient Mexican bell.

doubt, in the rattle, at first a nut-shell or a gourd; later it was modeled in clay, and in time the same idea was worked out in the legs and ornaments of vessels and in the heads and other parts of life forms, which were made hollow and supplied with tinkling pellets. With the acknowledged skill of these people in the working of metals, there is no reason why the bells described should not have been manufactured independently of European aid and influence.

It should be observed that if these early American bells were copied from or based upon Spanish originals they would not probably vary greatly in type with the various sections from which they are recovered, but it is observed that marked and persistent differences do occur. The well known Mexican bell, an example of which is outlined in Fig. 20, although of bronze, is generically distinct in form and construction.

RÉSUMÉ.

In a brief review I may recall the more salient points regarding the use of metals in ancient Chiriqui. Gold, silver, copper, and tin are represented.

Gold and copper were very plentifully distributed among the Isthmian races, but we have little information upon the sources of supply. Free gold is found in the stream beds of many localities and copper was probably found in its native state in some convenient locality; yet it is not impossible that these metals were transported from distant regions, as there must have been considerable intercourse between the inhabitants of Chiriqui and those of Grenada on the south and of Central America on the north. Silver and tin are found in alloys with gold and copper, but not as independent metals. The silver-gold alloy is probably a natural compound. In no case have I found silver to exceed 6 per cent. of the composite metal. Tin was artificially alloyed with copper, forming bronze. The latter metal resembles our ordinary bronze in color and hardness, but I am unable to secure more than a qualitative analysis on account of the scarcity of specimens available for the purpose. We have no information in regard to the origin of the tin. It is not found in a native state and since it seems hardly probable that the Chiriquians understood smelting ores we are left in doubt as to whether it was obtained from more cultured nations to the north or south or from Europeans. The gold-copper alloys appear to range from pure gold to pure copper.

The great majority of objects were formed by casting in molds. Hammering was but little practiced, excepting, apparently, in the formation of sheet gold, which was probably an indigenous product. Repoussé work is not found, save as represented in the crimping and indenting of gold leaf. Engraving and carving were not practiced. It may be considered certain that gilding, or at least plating, was understood.

The objects are obtained from ancient graves, of which no record or reliable tradition is preserved. They are all ornaments, no coin, weapon, tool, or utensil having come to my notice. The absence of utensils and of hammered objects of any kind strikes me as being rather extraordinary, since it is popularly supposed that hammering should, in the normal succession of events, precede casting and that utensils should be made before elaborate ornaments.

The work exhibits close analogies with that of the mainland of South America, but these analogies appear to be in material, treatment, and scope of employment rather than in the subject matter of the conceptions. The personages and zoömorphic characters represented are characteristically Chiriquian, and were derived no doubt from the mythology of the locality. These works affiliate with the various works

in stone and clay, the art products of the province thus constituting a fairly homogeneous whole, and being entirely free from traces of European influence.

Metals do not come into use early in the history of a race, as they are not found in shapes or conditions suitable for immediate use, nor are they when found sufficiently showy to be especially desirable for ornaments. A long period must have elapsed before the use of metals was discovered at all and a longer period passed by before they were worked, and, in the light of our knowledge of the ancient tribes of the United States, it would seem that a considerable degree of culture may be achieved before the casting of metals is understood; but in the ordinary course of progress the discovery of methods of alloying rare metals would be far separated from that of the simple fusing and casting of a single metal, such as gold. The Chiriquian peoples not only had a knowledge of the methods of alloying gold with copper and apparently copper with tin, but, if our data are correct, they were able to plate the baser metals and alloys with sheet gold, and, what is far more wonderful, to wash them with gold, producing an effect identical with that of our galvanic processes.

The character of the conceptions embodied in the art unite with evidences of technical skill to prove to us that American culture, as represented by the ornaments of Chiriqui, was not the product of a day, but of long periods of experiment and progress.

The sum of the art achievements of these peoples indicates perhaps a somewhat lower degree of culture than that attained by the Mexicans and the Peruvians, the ceramic art alone challenging the world in respect to refinement of form and simplicity and delicacy of treatment.

FIGURES MODELED IN CLAY SHOWING CLOSE ANALOGIES WITH THE WORK IN GOLD.

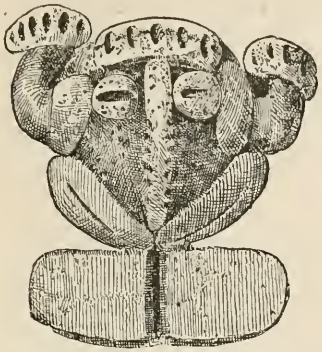

FIG. 21. Frog modeled in clay and used as a vase ornament.

FIG. 22. Grotesque anthropomorphic figures, used in a stool like object of clay.